

FORM PTO-1399
(REV 10/97)

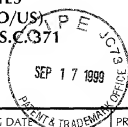
U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

DATE: September 17, 1999

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

EXPRESS MAIL LABEL NO.

EPO 09/381573

ATTORNEY DOCKET NO.
35763/DBPU.S. APPLICATION NO.
To Be Assigned

INTERNATIONAL APPLICATION NO.

PCT/DE98/00853 ✓

INTERNATIONAL FILING DATE

16.March.1998 ✓

PRIORITY DATE CLAIMED

18.March.1997 ✓

TITLE OF INVENTION

DEVICE FOR CUTTING ANY WIDTH OF WOOD OR OTHER MATERIALS ✓

APPLICANT(S) FOR DO/EO/US

Sven Blum and Peter Herberth ✓

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2)).
 - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/LUS).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☒ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items below concern other document(s) or other information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.
 - ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☐ Small entity claim with a copy of this transmittal letter attached.
17. ☒ International search report.
18. ☒ International preliminary examination report.
19. ☒ Extra set of drawings
20. ☐
21. ☐

09381573-091709

U.S. APPLICATION NO. (When Filing PCT/PTO) To Be Assigned 097381573		INTERNATIONAL APPLICATION NO. PCT/DE98/00853		ATTORNEY DOCKET NO. 35763/DBP	
<input checked="" type="checkbox"/> The following fees are submitted: (see Note (1) below) Basic National Fee (37 CFR 1.492(a)(1)-(5)): Search Report has been prepared by the EPO or JPO \$ 840.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) . . . \$ 670.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) . . . \$ 760.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO . . . \$ 970.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)(4) . . . \$ 96.00 ENTER APPROPRIATE BASIC FEE AMOUNT = \$ 840.00				CALCULATIONS PTO USE ONLY	
Surcharge of \$130 for furnishing the oath or declaration later than <input type="checkbox"/> 0 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
Claims	Number Filed	Number Extra	Rate		
Total Claims	16 ⁺⁺ -20=	0	X \$18	\$	0.00
Independent Claims	1 -3=	0	X \$78	\$	0.00
Multiple dependent claim(s) (if applicable)			+ \$260	\$	260.00
TOTAL OF ABOVE CALCULATIONS =				\$	1,100.00
Reduction by 1/2 for filing by small entity, if applicable. Verified Small entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).				\$	
SUBTOTAL =				\$	1,100.00
Processing fee of \$130 for furnishing the English translation later than <input type="checkbox"/> 0 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
TOTAL NATIONAL FEE =				\$	1,100.00
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				\$	40.00
TOTAL FEES ENCLOSED =				\$	1,140.00
Note (1): The basic national fee must be paid when filing this application. The 20-month time limit (37 CFR § 1.494) and 30-month time limit (37 CFR § 1.495) are not extendable.				Amount to be: refunded \$ charged \$	
a. <input checked="" type="checkbox"/> A check in the amount of \$ 1,100.00 (filing fee) and \$40.00 (recording fee) to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 03-1728 . A duplicate copy of this sheet is enclosed.					
NOTE (2): Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO: D. Bruce Prout CHRISTIE, PARKER & HALE P.O. Box 7068 Pasadena, CA 91109-7068					
				By <i>D. Bruce Prout</i> D. Bruce Prout Reg. No. 20,958	

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

This paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" under 37 CFR § 1.10, Mailing Label No. 368756799US

Applicant : Sven Blum et al.
Application No. : To Be Assigned
Filed : September 16, 1999
Title : DEVICE FOR CUTTING ANY WIDTH OF WOOD OR
OTHER MATERIALS
Grp./Div. : To Be Determined
Examiner : To Be Determined
Docket No. : 35763/DBP/M521

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Post Office Box 7068
Pasadena, CA 91109-7068
September 17, 1999

Commissioner:

Please amend the above-identified application as follows:

IN THE CLAIMS:

Please amend claims 3, 5, 6, 9, 10, 11, 12, 13, 14, 15 and 16 as noted below.

Claim 3, line 1, delete "and" and insert therefor --or--.

Claim 5, line 1, delete "one of claims 3 or 4" and insert therefor --claim 3--.

Claim 6, lines 1 and 2, delete "one of the preceding claims" and insert therefor --claim 1--.

Claim 9, lines 1 and 2, delete "one of the preceding claims" and insert therefor --claim 1--.

Claim 10, lines 1 and 2, delete "one of the preceding claims" and insert therefor --claim 1--.

Claim 11, lines 1 and 2, delete "at least one of the preceding claims" and insert therefor
--claim 1--.

Claim 12, lines 1 and 2, delete "at least one of the preceding claims" and insert therefor
-- claim 1--.

Claim 13, lines 1 and 2, delete "at least one of the preceding claims" and insert therefor
-- claim 1--.

Application No. To Be Assigned

Claim 14, lines 1 and 2, delete "at least one of the preceding claims" and insert therefor -- claim 1--.

Claim 15, lines 1 and 2, delete "at least one of the preceding claims" and insert therefor -- claim 1--.

Claim 16, lines 1 and 2, delete "at least one of the preceding claims" and insert therefor -- claim 1--.

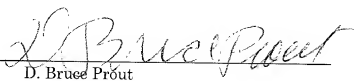
REMARKS

In view of the foregoing amendments, consideration and allowance of this application is respectfully requested.

Respectfully submitted,

CHRISTIE, PARKER & HALE, LLP

By


D. Bruce Prout
Reg. No. 20,958
626/795-9900

DBP/sfc

:::ODMA\SOFTSOL\311\CPHFAS\205132\0

Docket No. : 35763/DBP/M521

CHRISTIE, PARKER & HALE, LLP

Applicant or Patentee : Sven Blum et al.

Post Office Box 7068

Application or Patent No. : To Be Assigned

Pasadena, CA 91109-7068

Filed or Issued : To Be Assigned

(626) 795-9900

Entitled : DEVICE FOR CUTTING ANY WIDTH OF WOOD OR OTHER MATERIALS

**VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS
(37) CFR 1.9(f) & 1.27(c) - SMALL BUSINESS CONCERN**

I hereby declare that I am

_____ the owner of the small business concern identified below:

xx _____ an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF SMALL BUSINESS CONCERN : Interholz Technik GmbH

ADDRESS OF SMALL BUSINESS CONCERN : Weisserlenstrasse 11, D-79108 Freiburg, Germany

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.12, and reproduced in 37 CFR 1.9(d), for the purposes of paying reduced fees to the United States Patent and Trademark Office, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention entitled **DEVICE FOR CUTTING ANY WIDTH OF WOOD OR OTHER MATERIALS** by inventor(s) **Sven Blum and Peter Herberth** described in

_____ the specification filed herewith

_____ Application No. 09/381,573 filed September 17, 1999

_____ Patent No. _____ issued _____

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights in the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(e). *NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

NAME :

ADDRESS : _____ INDIVIDUAL _____ SMALL BUSINESS CONCERN _____ NONPROFIT ORGANIZATION

NAME :

ADDRESS : _____ INDIVIDUAL _____ SMALL BUSINESS CONCERN _____ NONPROFIT ORGANIZATION

**VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS
(37) CFR 1.9(f) & 1.27(c) - SMALL BUSINESS CONCERN**

Docket No.: 35763/DBP/M521

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING : Werner Jäger
TITLE OF PERSON IF OTHER THAN OWNER : Head of Technical Department
ADDRESS OF PERSON SIGNING : Albert-Stehlin-Str. 6
D - 79385 Rheinhausen

SIGNATURE

ppa. Werner Jäger

DATE: September 16th, 1999

DBP/sfc

SFC PAS25103.1-2-en/99 226 pm

New description
14.04.1999

page 1

PCT/DE98/00853
INT118WO

INT118WO

5 Device for cutting wood or other materials
 to any desired width

10 Description

15 The invention relates to a device for cutting wood or
 other materials to a width of any size according to the
 preamble of claim 1.

20 A cutting device of this kind is used inter alia in
 commercially available multi-blade or circular trimming
 saws. The main design structure of these appliances is
 described by way of example in the Holz Lexikon of E.
 Konig, DRW Verlags GmbH, Stuttgart, 1977, 2nd edition,
 Volume I : pps. 101-102 and Vol. II : pps. 468-469. These
 types of circular saws generally have two or more circular
 saw blades set on a drive shaft wherein the distance
 between the blades is variable.

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In order to guarantee a free cutting, the circular saw blades are designed mostly wider in the cutting area for example by setting the saw blade. A resulting cutting width is thus produced from the distance of the side cutting edges of two adjoining circular saw blades. However the resulting cutting widths can generally only be inadequately anticipated just by measuring the distance. Frequently after a rough pre-setting a test sample has to be cut followed by finer re-adjustment.

Adjusting the cutting widths is undertaken in the simplest case by a multi-blade saw box which is assembled outside of a machine and on which the individual saw blades are placed, spaced out and fixed for no further adjustment. When changing a blade the saw box is replaced as a whole in order to keep the times during which the machine is stationary as short as possible.

With these machines changing the cutting width is only possible by a time-consuming labour-intensive tool change since the saw blades which are once located in the machine can no longer be axially displaced on the drive shaft. In the event of re-adjustment the complete saw box has to be dismantled again so that for example the relevant cutting width can be adjusted to the required extent for example by inserting further spacer members.

These drawbacks are overcome in appliances where a variable cutting width adjustment is undertaken by electronically controlled, motor-operated or hydraulically-operated axial displacement of one or more saw blades. In the company catalogue 2/94 "Multi-blade circular saws and circular trimming saws" of Messrs. Interholz Raimann GmbH a four-fold blade adjustment system is illustrated on page 12, Figure 6. Each of the

AMENDED PAGE

individual saw blades is mounted on a separate displacement head which guarantees by means of a gripper-like arm through a motor-driven spindle an axial displacement and accurate positioning of each individual saw blade. Positioning the individual saw blades and any re-adjustment which might possibly be required are thereby effected through electronic path measuring devices and accurately controlled spindle motors.

- 5
- 10 Appliances of this kind are very cost-intensive and can only be used economically in the case of cutting widths which have to be frequently changed. The same drawbacks arise also for the circular saws described in WO 89/10824 whose four driven axles provided with circular saw blades
- 15 are adjustable separately by servo cylinders. Further drawbacks of the motor-driven adjustable multi-blade and circular trimming saw blades described above are the limited number of saw blades which are to be used at the same time as well as the greater minimum cutting width
- 20 compared to multi-blade saw boxes since the comparatively wide construction of the displacement heads does not allow the individual saw blades to be positioned closely next to each other.
- 25 Furthermore from US Patent specification 15 25 323 a device is known for cutting materials to any width which has two circular saw blades (12, 12') which by means of a centrally aligned drive shaft (11) execute a rotational cutting movement and wherein to vary a cutting width at
- 30 least one circular saw blade is mounted axially displaceable on the drive shaft wherein disc-like support bodies (50, 60) are provided mounted axially displaceable on the drive shaft and on which at least each one circular saw blade (12) is to be fixedly mounted wherein the axial
- 35 displacement of the circular saw blades is carried out

by means of guide spindles (52, 62) running parallel to the axis of the drive shaft (11) and passing through the support bodies and which during the circular cutting movement of the circular saw blades are moved on a circular path about the axis of the drive shaft (11).

The object of the invention is to develop a device for cutting wood or other materials to a width of any size, which provides a flexible, cost-effective displacement which can be carried out inside the machine and which can be reliably fixed during the sawing operation wherein the cutting widths can be controlled and adjusted by means of a suitable measuring system.

This is achieved according to the invention through a cutting device having the features of claim 1.

According to the invention the cutting device has disc-shaped support bodies mounted axially displaceable on the drive shaft and on each of which at least one circular saw blade can be fixedly mounted by means of a suitable saw
5 blade socket. Axial displacement of the circular saw blades takes place by means of guide spindles running parallel to the drive shaft axis and passing through the support bodies wherein the guide spindles are moved during the circular cutting movement of the circular saw blades
10 on a circular path around the axis of the drive shaft.

By arranging the guide spindles about the axis of the drive shaft and positioning them in the disc-like, axially displaceable support bodies which are rotationally secured
15 to the drive shaft it is possible to provide a compact method of construction which with a symmetrical arrangement of the guide spindles on the smallest possible circle circumference lying concentric with the axis of the drive shaft guarantees a smoothly balanced cutting
20 movement with the smallest possible additional mass inertia forces. During the adjustment process when the drive shaft is stationary the guide spindles which preferably have a thread, e.g. a trapezoidal thread, serve to transfer the force and motion to the relevant support
25 bodies which are to be axially displaced.

Through such an arrangement it is ensured that the adjustment of the cutting width can be carried out, as opposed to using multi-blade saw boxes, without any time-consuming labour-intensive dismantling of the saw blades
30 inside the machine. Rather the support bodies are designed significantly narrower compared with the displacement heads of known motorized adjustable multi-blade and circular trimming saws, so that it is possible
35 to provide smaller minimum cutting widths and/or a larger number of circular saw blades which can be fitted.

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As a rule one circular saw blade is provided for each axially displaceable support body. The invention also includes variations wherein several circular saw blades are to be fixed on one support body and which then have a fixed space from each other and can only be axially displaced together. However variations are likewise also possible wherein no circular saw blade is mounted on individual support bodies. This can then be advantageous for example when during one work process there are fewer circular saw blades required than the number of support bodies, but dismantling the excess support bodies from the cutting device would be uneconomic however.

In a preferred embodiment of the invention at least one support body is axially fixed. This support body is preferably located on the outside at the end of the guide spindles whose ends are mounted in same freely rotatable, but axially immovable. A favourable distribution of the centrifugal forces which arise during the cutting movement is thereby produced.

A circular saw blade is preferably mounted on the axially fixed support body to be used as the reference from which the further cutting widths are determined. However there are also further possible variations wherein no circular saw blade is mounted on the fixed support body so that all the saw blades are axially displaceable.

In a preferred variation of the invention the individual displaceable support bodies are each to be displaced axially independently of each other. Thus only one support body is only displaced by means of each guide spindle whilst the other support bodies remain unaffected by the activated guide spindle.

One support body is preferably axially displaced by two diametrically opposite guide spindles mounted at the same distance from the axis of the drive shaft. The group of guide spindles resulting from this is preferably to be mounted on a circular circumference which lies concentric with the axis of the drive shaft. This arrangement allows a symmetrical distribution of the guide spindles at the same distance around the axis of the drive shaft.

- 10 By using two diametrically opposite guide spindles for each displaceable support body it is possible to guarantee during the axial displacement of the support body a transfer of movement engaging symmetrically relative to the axis of the drive shaft. The invention also includes variations wherein more than two guide spindles are provided per one axially displaceable support body.

- 20 The relevant associated guide spindles carry out a transport movement which serves for the axial displacement and which preferably corresponds to a rotational movement about the relevant longitudinal axis and which can be synchronised by means of gearing between the two spindles. Through the synchronised transport movement of the guide spindles in the same or opposite directions it is possible to reduce the risk of canting and/or jamming of the support bodies on the drive shaft. In one variation of the invention this gearing is designed as belt gearing. The invention also includes variations wherein the coupling of the transport movement is achieved by other gearing, e.g. gearwheel or chain gearing.

In a preferred variation of the invention the or each gearing is mounted inside a drive housing. On the one hand this produces a compact method of construction and on the other ensures that for example during a finishing
5 process no impurities in the form of chippings can clog up or block the individual gears.

According to the invention in one variation of the invention stud attachments are provided for adjusting the
10 cutting widths by means of which the relevant guide spindles can be driven to produce their transport movement. The transport movement is thereby to be applied to the relevant stud attachments manually or motorized by means of a suitable tool. This tool can be for example a
15 correspondingly precision-shaped key which can be set on the relevant stud attachment and operated manually, or a motor-operated screw driver whose drive shaft is to be coupled rotationally secured to the relevant stud attachment. The invention also includes variations
20 wherein the transport movement of each guide spindle to be driven can be applied centrally with means belonging to the actual sawing machine, thus inside in the machine.

The stud attachments are preferably shaped from the
25 extended ends of the guide spindles so that the transport movement can be applied simply direct to a guide spindle.

In a preferred variation a complete set of support bodies inclusive of the circular saw blades mounted thereon can
30 be assembled together with the associated guide spindles and the drive housing as a structural unit outside of the machine chamber and in the event of a tool change can be pushed and fixed onto the drive shaft like a saw box. The fixing is preferably undertaken axially by means of a
35 grooved nut. The cutting device according to the

invention can be fitted out like a multi-blade saw box and allows pre-setting of the cutting widths outside of the machine.

- 5 With comparatively low setting-up costs a cutting device of this kind combines the advantages of a multi-blade saw box, such as quick tool block change, with small cutting widths and furthermore allows the cutting widths to be adapted without dismantling the device.

10

- A saw blade clamping device is provided for radially and/or axially fixing circular saw blades which are mounted axially displaceable on a drive shaft. This saw blade clamping device has at least one clamping element
15 which is mounted in a drive shaft like a piston and which is to be displaced radially by means of a hydraulically produced force action. In a hydraulically unstressed starting position of the clamping elements the circular saw blades can be displaced as up to now axially on the
20 drive shaft. Through hydraulically produced compression forces the clamping elements can however be brought into an end position where the circular saw blades are connected in keyed and/or force-locking engagement rotationally secured with the drive shaft so that they can
25 no longer be axially displaced on the drive shaft.

- The saw blade clamping device has the advantage that a secure clamping of a variable number of circular saw blades in any position is possible. Neither saw boxes nor
30 intermediate rings are required to set a fixed distance between the individual circular saw blades which is not to be adjusted during the sawing operation. Through the saw blade clamping device an immovable secure locking of the individual circular saw blades on the drive shaft is

guaranteed during the sawing operation. The saw blade clamping device is also to be used independently of the cutting device according to the invention. Thus for example the clamping device according to the invention can also be used in conjunction with electrically, hydraulic or manually axially positioned circular saw blades.

With the cutting device according to the invention it is possible by means of the saw blade clamping device to achieve an axial securing of the positioned circular saw blades, a relaxation of the guide spindles and a blocking of a slight axial mobility as a result of the threaded play. In each case compared to the use of saw boxes there is a significant saving of both time and labour when setting the cutting widths since the circular saw blades can be axially displaced immediately when required through the lock which is quick and easy to release and which can then be re-locked again.

Through the tight seal of the clamping elements relative to the drive shaft, on the one hand there is no risk of the circular saw blades or the workpieces which are to be processed becoming soiled e.g. through hydraulic oil, and on the other the clamping device itself is not susceptible to contamination through swarf or the like. A large proportion of the swarf arising is moreover kept away from the device during the sawing operation through centrifugal forces.

The circular saw blades are preferably mounted fixed on disc-like support bodies according to claim 1 or in known way on blade socket rings provided for this purpose. By means of the support bodies or the blade socket rings it is possible to mount the circular saw blades axially displaceable on the drive shaft. Since both the support bodies and the blade socket rings can be made

significantly narrower than the displacement heads of known motorized adjustable multi-blade and trimming circular saws, it is possible to provide smaller minimum cutting widths and/or a larger number of circular saw blades which can be mounted.

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In a preferred design of the invention the clamping elements correspond in form and action to a radially displaceable locking key, of which preferably two are provided wherein these are mounted diametrically opposite on the drive shaft. The invention also includes variations wherein only one clamping element or wherein more than two clamping elements are provided. Clamping elements can likewise be provided which have profiling engaging for example in the locked state in corresponding profiling of the circular saw blades, support body or blade socket rings, in order to produce for example an additional keyed connection.

In an advantageous variation of the invention a maximum radial displacement of the clamping elements is to be restricted by lift restricting elements, more particularly lifting screws. These are expedient for example so that the clamping elements do not fall out of their bearing when no circular saw blades are fitted on the drive shaft.

30
35

In a preferred embodiment of the invention the hydraulic force action is to be applied by means of a piston which is to be displaced manually or by means of a motor. The piston is to be displaced axially in the event of manual operation for example by a handle or a hand wheel through a threaded bolt which is to be screwed in and out of a thread.

In a further variation of the invention the hydraulic force action is to be applied by means of a hydraulic device inside the machine or hydraulic device outside of the machine. Since many machines already have a hydraulic

device inside the machine a build up of pressure which is required to lock the circular saw blades or to radially displace the clamping elements is also to be applied by means of a device of this kind. The saw blade clamping device according to the invention is integrated in a hydraulic control and is thereby to be operated quickly, easily and reliably in simple manner. The same also applies in the case of a connection of the saw blade clamping device to a hydraulic device outside of the machine.

In an advantageous variation the saw blade clamping device according to the invention has a manometer by means of which the hydraulic force action can be monitored. A manometer for reading the pressure with which the support bodies or blade socket rings are clamped, makes it possible to check whether there is sufficient locking of the circular saw blades with a view to a safe operating process.

In a preferred variation of the invention a measuring system is provided for adjusting the cutting width wherein the distance between the side cutting edges of two adjoining circular saw blades which are displaceable relative to each other can be measured.

The measuring system preferably has a measuring plate with measuring surfaces which is connected, by a rotatable extensible rod mounted parallel to the axis of the drive shaft, to a path measuring system mounted fixed relative to the drive shaft. The invention also includes variations wherein a measuring system of this kind is to be used outside of the machine, for example where the cutting device is assembled like a structural unit.

In an advantageous design of the invention an adjustable measuring plate is provided as the measuring plate which has two measuring faces which lie parallel to each other in a common plane at right angles to the axis of the drive shaft and which point in opposite directions. The measuring system thereby preferably has an indicator which is to be set to zero at any measuring point so that the cutting widths can be detected in the form of incremental increase or chain measurements.

In a particularly advantageous design of the invention the measuring system has a measured value memory and a computer unit. In the measured value memory the individual measuring points can be stored in the form of incremental chain or increase measurements and/or in the form of reference measurements in relation to a reference point and can be processed mathematically with each other in the computer unit.

The effects of a cutting width adjustment on the other cutting widths and the adaptations which are to be made can thereby be detected immediately. The measuring system preferably has a display in which both the measured value in relation to a reference point fixed relative to the drive shaft (reference measurement) and also the incremental measured value in relation to a freely selectable reference point through nullification of the display (chain measurement) can be displayed.

This variation has the advantage that a rapid determination of the distance between the cutting edges of two adjoining saw blades is possible. It is thereby possible during the adjustment or setting process to keep a constant check that the required distance between the cutting edges is being observed.

Further advantages of the invention will now be explained in the following description of the embodiments with reference to the drawings in which:

- 5 Figure 1 shows a cutting device with seven circular saw blades and a measuring system for setting the cutting width;
- Figure 2a shows the guide of a guide spindle in a support body with threaded bore;
- 10 Figure 2b shows the guide of a guide spindle in a support body with through bore;
- Figure 3 is a side view of a circular saw blade mounted displaceable on the drive shaft;
- Figure 4 shows a cutting device with seven circular saw blades during the sawing process and
- 15 Figure 5 shows a hydraulically operable saw blade clamping device.
- Figure 1 shows an embodiment of the cutting device
- 20 according to the invention. The drawing shows a drive shaft 1 of a saw machine on which seven circular saw blades 2a to 2g are mounted each by means of a disc-like support body 3a to 3g, shown in section. The circular saw blades 2a to 2g have blades 4 on their outer circumference
- 25 and are each fixed in known way on the support bodies 3a to 3g by means of saw blade sockets 5. The support bodies 3a to 3g are mounted by means of a locking key 6 rotationally secured on the drive shaft. They have several recesses in which guide spindles 7a, 7b are

mounted running parallel to the axis of the drive shaft 1. The guide spindles, of which for clarity in Figure 1 only two are illustrated, have a trapezoidal thread and engage through a drive housing 8 shown only diagrammatically.

5 They have at their ends projecting out of the drive housing 8 stud attachments 9a, 9b which in the illustrated embodiment have a square cross-section. The other ends of the guide spindles 7a, 7b each have two discs 11a to 11d and each have two fastening pins 12a to 12d by means of

10 which one of the support bodies 7g and the circular saw blade 2g mounted thereon are axially fixed. The cutting device is fitted as a whole, like a saw box, onto the drive shaft 1 and fastened by means of a shaft nut 13.

15 In the embodiment by turning the stud attachments 9a, 9b in one of the directions illustrated by the arrows, one of the circular saw blades 2b can be displaced axially to the left or right in the direction of the arrow. The rotational transport movement of the two guide spindles

20 7a, 7b is coupled in the drive housing by means of a belt gearing so that only one of the two guide spindles 7a, 7b is to be driven through the relevant stud attachment 9a, 9b.

25 The support body 3b and the circular saw blade 2b mounted thereon are moved axially by the rotating guide spindles 7a, 7b since as shown in Figure 2a the external thread of the guide spindle 7 engages in a corresponding internal thread of the recesses in the support body 3 through which

30 it passes. The other support bodies 3a and 3c to 3g are not affected by the rotating guide spindles 7a, 7b since, as illustrated in Figure 2b, the recess of the relevant

unaffected support body 3 through which the guide spindle 7 passes has a correspondingly large diameter and no internal thread.

- 5 For axially displacing the other support bodies 3a and 3c to 3f other guide spindles which are not shown for reasons of clarity, are to be driven. The support body 3g is axially fixed and is to be displaced by no guide spindle.
- 10 In the illustrated embodiment each axially displaceable support body 3a to 3f is faced by each two guide spindles which are diametrically opposite one another and which are all mounted together at the same distance from the axis of the drive shaft 1. With six displaceable support bodies
- 15 3a to 3f the embodiment illustrated has overall twelve guide spindles.

- In Figure 3 the axially displaceable circular saw blade 2b of Figure 1 is shown in side view (section III-III). It
- 20 is mounted by means of the saw blade socket 5 in known way on the support body 3b. The support body 3b is connected rotationally secured to the drive shaft 1 by means of a locking key 6. Overall twelve guide spindles 7a to 7l symmetrically spaced out at the same distance from the
- 25 axis of the drive shaft pass through the support body 3b. Two diametrically opposite guide spindles 7a, 7b engage as in Figure 2a into an internal thread of the recesses through which they pass whilst the remaining ten guide spindles 7c to 7l are mounted as in Figure 2c without
- 30 action freely rotatable in the support body 3b.

5 The seven support bodies 3a to 3g illustrated in Figure 1 are accordingly not structurally identical since the position of the groove for holding the locking key 6 relative to the recesses with the internal thread differs each time and the support body 3g has no recesses with thread.

10 Furthermore in Figure 1 a measuring system is shown diagrammatically which has a reversible measuring plate 14 which has two measuring faces 15a, 15b which lie parallel to each other in a common plane at right angles to the axis of the drive shaft 1 and which point in opposite directions. The reversible measuring plate 14 is connected by a rotatable and extensible rod 16 mounted
15 parallel to the axis of the drive shaft 1 to an evaluating and indicator device 17 of a path measuring system.

20 The two measuring faces 15a, 15b serve to measure the distance between the side cutting edges of the blades 4 of two adjoining circular saw blades 2a to 2g. In the illustrated embodiment the position of the reversible measuring plate 14 is shown at two different measuring points which are to be used when determining the distance between the cutting edges 4 of the circular saw blades 2b
25 and 2c. Between the two measuring points the reversible measuring plate is to be turned 180° parallel to the axis of the drive shaft 1.

30 Preferably during adjustment the axially fixed circular saw blade 2g is used as the starting point. The reversible measuring plate 14 is to be placed with the corresponding measuring surface 15a against the side cutting edge (in Figure 1 left-hand cutting edge) of the blade 4 of the axially fixed circular saw blade 2g. The
35 indicator is set to zero, the reversible measuring plate 14 is to be turned and placed with the other measuring face 15b against the side cutting edge (in Figure 1 the

right hand cutting edge) of the circular saw blade 7f adjoining same. By turning the stud attachment provided for this circular saw blade 7f the circular saw blade 7f is to be axially displaced until the desired measurement is provided. The same procedure is followed when setting the remaining measurements. The circular saw blade which is last adjusted is then to be regarded as the fixed saw blade.

10 An additional measured value memory and computer unit can furthermore also allow the setting of the circular saw blades and to check them relative to a fixed common fixing point in order to minimize the risk of error magnification and to simplify a subsequent change in the measurements.

15 In Figure 4 the embodiment of the cutting device according to the invention described in Figure 1 is shown for cutting into a wooden plank. The different resulting cutting widths 18a to 18f can be clearly seen.

20 Figure 5 shows a hydraulically operated saw blade clamping device. Two clamping elements 21 are mounted in the drive shaft 20 and have substantially the form of a locking key and are guided like a piston in correspondingly accurately shaped axially aligned recesses of the drive shaft 20 and are sealed in known way by a seal 34 to prevent oil leakage. The clamping elements 21 lie diametrically parallel opposite one another on the drive shaft 20 and are restricted in their radial stroke through lift screws 22. The drive shaft 20 has a central blind hole bore 23 which is connected at its inner end to a radially aligned through bore 24. The radial through bore 24 ends each time on the underneath of the clamping elements 21. The drive shaft 20 has at the outlet point of the central blind hole bore 23 a pressure chamber 25 in which a piston 26 is mounted axially displaceable. The piston 26 is connected by a threaded bolt 27 to a manually operated

pressure generating button 28. The pressure generating button 28 can be designed optionally with or without manometer 30. The manometer 30 is connected through a central bore 31 in the threaded bolt 27 and through channels in the piston 26 to the pressure chamber 25. The channels in the piston 26 are not shown in further detail for reasons of clarity. The pressure chamber 25 and the piston 26 mounted therein are to be closed pressure tight by a cover 29 which is to be screwed onto the drive shaft 20. The threaded bolt 27 is guided in a central threaded bore 33 of the cover 29.

By turning the pressure generating head 28 a hydraulic pressure is produced through the threaded bolt 27 by means of the piston 26 in the pressure chamber 25 which is filled with oil. This pressure is brought up to the clamping elements 21 through the central blind hole bore 23 and the radial through bore 24 in the drive shaft 20. The clamping elements 21 are formed as pistons and can travel a certain stroke. They clamp the circular saw blades 2a to 2g (not shown in this figure) in the individually desired positions. On the manometer 30 it is possible to read the pressure with which the support bodies 3a to 3g (likewise not shown) or the blade socket rings are clamped.

CLAIMS

1. Device for cutting materials, preferably wood, to any width, with at least two circular saw blades (2a, 2b, 2c,
5 2d, 2e, 2f, 2g) which by means of a centrally aligned drive shaft (1, 20) execute a rotary cutting movement and wherein to vary the cutting width at least one circular saw blade (2a, 2b, 2c, 2d, 2e, 2f, 2g) is mounted displaceable axially on the drive shaft wherein disc like
10 support bodies (3a, 3b, 3c, 3d, 3e, 3f, 3g) are provided axially displaceable on the drive shaft whereby at least one circular saw blade (2a, 2b, 2c, 2d, 2e, 2f, 2g) is to be mounted fixed on each support body whereby the axial displacement of the circular saw blades (2a, 2b, 2c, 2d,
15 2e, 2f, 2g) is carried out by means of rods (7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, 7i, 7j, 7k, 7l) running parallel to the axis of the drive shaft (1, 20) and engaging through the support bodies (3a, 3b, 3c, 3d, 3e, 3f, 3g) wherein the rods are moved during the circular cutting movement of
20 the circular saw blades (2a, 2b, 2c, 2d, 2e, 2f, 2g) on a circular path about the axis of the drive shaft (1, 20) **characterised in that** the rods (7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, 7i, 7j, 7k, 7l) are formed as guide spindles (7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, 7i, 7j, 7k, 7l) fixed axially
25 on the drive shaft (1, 20) and each of which is screwed into an associated nut of a single support body (3a, 3b, 3c, 3d, 3e, 3f, 3g) associated with these guide spindles, and that all the support bodies (3a, 3b, 3c, 3d, 3e, 3f, 3g) can be fixed on the drive shaft (1, 20) by a common
30 hydraulic clamping strip (21).

2. Cutting device according to claim 1 **characterised in that** two diametrically opposite guide spindles (7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, 7i, 7j, 7k, 7l) mounted at equal distance from the axis of the drive shaft (1, 20) each displace one support body (3, 3a, 3b, 3c, 3d, 3f) axially on the drive shaft (1, 20).
3. Cutting device according to claims 1 and 2 **characterised in that** one transport movement of each two associated guide spindles (7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, 7i, 7j, 7k, 7l) serving for the axial displacement of the support body (3a, 3b, 3c, 3d, 3e, 3f) can be synchronised by means of a gear.
4. Cutting device according to claim 3 **characterised in that** the gearing is formed as a belt gearing.
5. Cutting device according to one of claims 3 or 4 **characterised in that** the or each gearing is or are mounted inside a drive housing (8).
6. Cutting device according to one of the preceding claims **characterised in that** to set the cutting widths (18a, 18b, 18c, 18d, 18e, 18f) stud attachments (9a, 9b) are provided by means of which the relevant guide spindles (7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, 7i, 7j, 7k, 7l) are to be driven to produce their transport movement.

7. Cutting device according to claim 6 **characterised in that** the stud attachments (9a, 9b) are shaped from the extended ends of the guide spindles (7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, 7i, 7j, 7k, 7l).

5

8. Cutting device according to one of claims 6 or 7 **characterised in that** the transport movement is to be applied to the relevant stud attachment (9a, 9b) manually or motorized by means of a suitable tool .

10

9. Cutting device according to one of the preceding claims **characterised in that** a complete set of support bodies (3a, 3b, 3c, 3d, 3e, 3f, 3g) inclusive of the circular saw blades (2a, 2b, 2c, 2d, 2e, 2f, 2g) mounted thereon together with the associated guide spindles (7a, 7b, 7c, 7d, 7e, 7f, 7g, 7h, 7i, 7j, 7k, 7l) and the drive housing (8) can be assembled as a structural unit and during a tool change can be pushed and fixed on the drive shaft (1, 20) like a saw box.

15

20

10. Cutting device according to one of the preceding claims **characterised in that** the circular saw blades (2a, 2b, 2c, 2d, 2e, 2f, 2g) are to be mounted fixed on disc-like support bodies (3a, 3b, 3c, 3d, 3e, 3f, 3g) or fixed on known blade socket rings and are mounted with these axially displaceable on the drive shaft (1, 20).

25

30

11. Cutting device according to at least one of the

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preceding claims **characterised in that** the clamping
elements (21) correspond in shape and action to close
tolerance screws.

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12. Cutting device according to at least one of the preceding claims **characterised in that** two clamping elements (21) are provided diametrically opposite one another on the drive shaft (1, 20).

13. Cutting device according to at least one of the preceding claims **characterised in that** lift restricting elements (22) more particularly lifting screws are provided for restricting the radial displacement of the clamping elements (21).

14. Cutting device according to at least one of the preceding claims **characterised in that** a manually or motor-driven displaceable piston (26) is provided for applying the hydraulic force action.

15. Cutting device according to at least one of the preceding claims 1 to 13 **characterised in that** a hydraulic appliance is provided inside or outside the machine for applying the hydraulic force action.

16. Saw blade clamping device according to at least one of the preceding claims **characterised in that** a manometer (30) is provided for monitoring the hydraulic force action.

ABSTRACT

5 The invention relates to a device for cutting wood or other materials with a saw blade clamping device for radially and/or axially fixing circular saw blades mounted axially displaceable on a drive shaft.

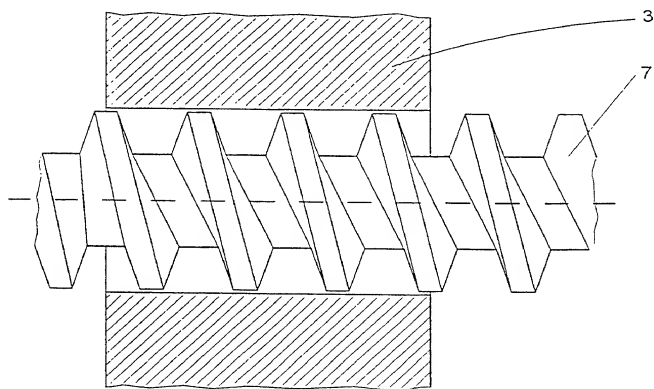
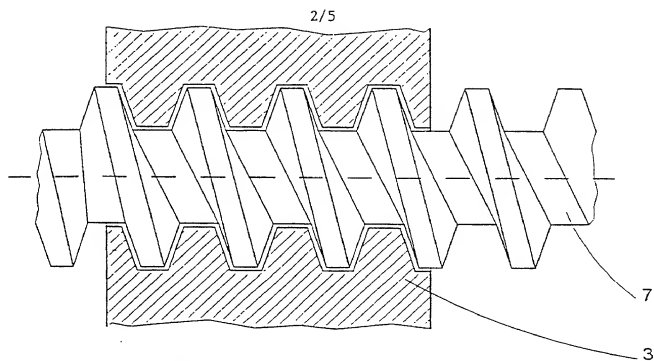
10 According to the invention support bodies (3) are provided axially displaceable on the drive shaft (1) for each one circular saw blade e.g. (2a). The axial displacement of the circular saw blades e.g. (2a) takes place by guide spindles e.g. (7) running parallel to the axis of the drive shaft and passing through the support bodies e.g. (3).

15 At least one clamping element (21) is mounted in the drive shaft 1, 20. The clamping element (21) is mounted radially displaceable. In a first stage the circular saw blades e.g. (2a) which are mounted on the support bodies (3) are thereby displaced. In a second stage the circular saw blades e.g. (2a) or support bodies e.g. (3) are connected to the drive shaft in keyed and/or force locking engagement.

25 Through the device according to the invention a displacement of the cutting width is possible without the time and labour intensive dismantling of the saw blades. The support bodies for the circular saw blades are 30 narrower than the known displacement heads for multi-blade circular saws. A larger number of circular saw blades can thereby be fitted on one axis.

Figure 5.





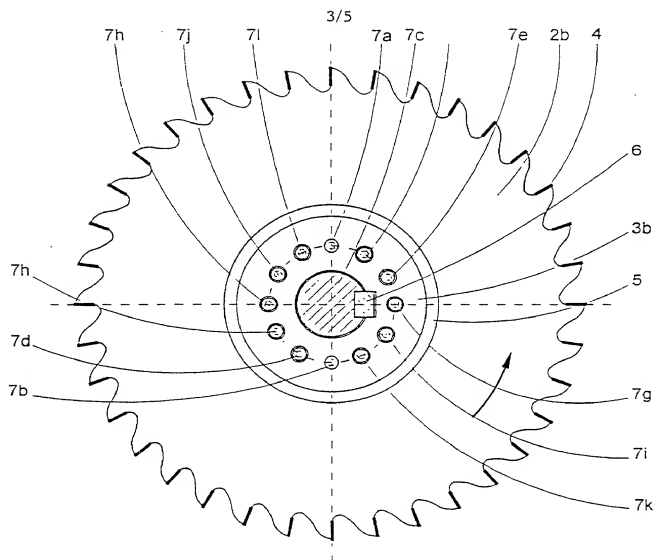


Fig.3



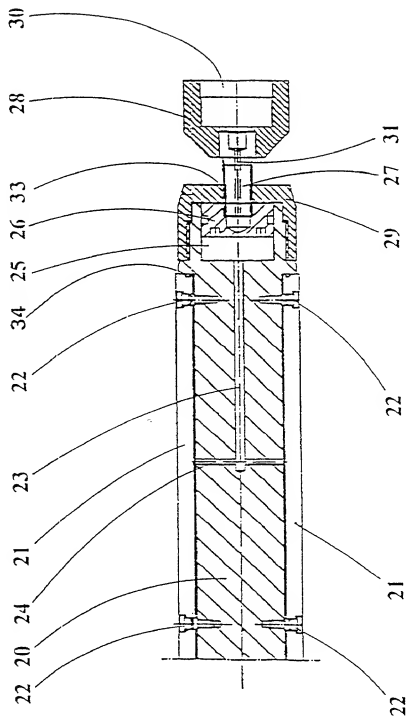


Fig. 5

DECLARATION AND POWER OF ATTORNEY
FOR PATENT APPLICATIONS

PATENT

Docket No. : 35763/DBP/M521

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled DEVICE FOR CUTTING ANY WIDTH OF WOODOR OTHER MATERIALS, the specification of which is attached hereto unless the following is checked:

X was filed on 16 March 1998 as United States Application Number or PCT International Application Number PCT/DE98/00853 and was amended on 16 April 1999.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of the foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

<u>Application Number</u>	<u>Country</u>	<u>Filing Date (day/month/year)</u>	<u>Priority Claimed</u>
297 05 755.3 ✓	Germany	18 March 1997	Yes
297 08 539.5 ✓	Germany	02 May 1997	Yes

I hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below.

<u>Application Number</u>	<u>Filing Date</u>
---------------------------	--------------------

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s), or any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

<u>Application Number</u>	<u>Filing Date</u>	<u>Patented/Pending/Abandoned</u>
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POWER OF ATTORNEY: I hereby appoint the following attorneys and agents of the law firm CHRISTIE, PARKER & HALE, LLP to prosecute this application and any international application under the Patent Cooperation Treaty based on it and to transact all business in the U.S. Patent and Trademark Office connected with either of them in accordance with instructions from the assignee of the entire interest in this application:

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FOR PATENT APPLICATIONS**

Docket No. 35763/DBP/M521

or from the first or sole inventor named below in the event the application is not assigned; or from MAIKOWSKI & NINNEMANN in the event the power granted herein is for an application filed on behalf of a foreign attorney or agent.

R. W. Johnston	(17,968)	John D. Carpenter	(34,133)	Lucinda G. Auciello	(42,270)
D. Bruce Prout	(20,958)	David A. Plumley	(37,208)	Norman E. Carte	(30,455)
Hayden A. Carney	(22,653)	Wesley W. Monroe	(39,778)	Joel A. Kauth	(41,886)
Richard J. Ward, Jr.	(24,187)	John W. Eldredge	(37,613)	Patrick Y. Ikehara	(42,681)
Russell R. Palmer, Jr.	(22,994)	Gregory S. Lampert	(35,581)	Mark Garscia	(31,953)
LeRoy T. Rahn	(20,366)	Grant T. Langton	(39,739)	Gary J. Nelson	(44,357)
Richard D. Seibel	(22,134)	Constantine Marantidis	(39,759)	Raymond R. Tabandeh	(43,945)
Walter G. Maxwell	(25,355)	Daniel R. Kimbell	(34,849)	Phuong-Quan Hoang	(41,839)
William P. Christie	(29,371)	Craig A. Gelfound	(41,032)	Jun-Young E. Jeon	(43,693)
David A. Dillard	(30,831)	Syed A. Hasan	(41,057)	Kathy Mojibi	(41,409)
Thomas J. Daly	(32,213)	Kathleen M. Olster	(42,052)	Cynthia A. Bonner	(P-44,548)
Vincent G. Gioia	(19,969)	Daniel M. Cavanagh	(41,661)		
Edward R. Schwartz	(31,135)	Molly A. Holman	(40,022)		

The authority under this Power of Attorney of each person named above shall automatically terminate and be revoked upon such person ceasing to be a member or associate of or of counsel to that law firm.

DIRECT TELEPHONE CALLS TO : D. Bruce Prout, 626/795-9900
SEND CORRESPONDENCE TO : CHRISTIE, PARKER & HALE, LLP
 P.O. Box 7068, Pasadena, CA 91109-7068

I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first joint inventor Sven Blum	Inventor's signature <i>[Signature]</i>	Date 6 Sep 1999
Residence and Post Office Address Schoenbergstrasse 12, 79291 Merdingen, Germany	<input checked="" type="checkbox"/>	Citizenship German

Full name of second joint inventor Peter Herbert	Inventor's signature <i>[Signature]</i>	Date 6 Sep 1999
Residence and Post Office Address Ignatz-Bruder-Strasse 3-74, 79813 Waldkirch, Germany	<input checked="" type="checkbox"/>	Citizenship Germany